TRANSPORTATION AND WELL-BEING:

EXPLORING POST-SECONDARY STUDENTS' COMMUTE SATISFACTION AND ITS

RELATIONSHIP TO CAMPUS PARTICIPATION AND SUCCESS

by

Ryan Taylor

Bachelor of Commerce, McGill University, 2012

A Major Research Paper

presented to Ryerson University

in partial fulfillment of the requirements for the degree of

Master of Planning

in

Urban Development

Toronto, Ontario, Canada, 2020

Author's Declaration for Electronic Submission of an MRP

I hereby declare that I am the sole author of this MRP. This is a true copy of the MRP, including any required final revisions.

I authorize Ryerson University to lend this MRP to other institutions or individuals for the purpose of scholarly research.

I further authorize Ryerson University to reproduce this MRP by photocopying or by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

TRANSPORTATION AND WELL-BEING:

EXPLORING POST-SECONDARY STUDENTS' COMMUTE SATISFACTION AND ITS

RELATIONSHIP TO CAMPUS PARTICIPATION AND SUCCESS

Master of Planning
in Urban Development
Ryerson University

ABSTRACT

This Major Research Paper examines the influence of commute satisfaction on campus participation and perceived academic success of post-secondary students as indicators of their well-being. Travel and attitudinal data was analyzed for 1,931 students from Ryerson University in Toronto, Ontario to determine if students perceive their commute to be a barrier to their campus participation and academic success, and if this perception changes with commute satisfaction. A large number of students reported their commute was a barrier to their campus participation and academic success, and binomial logistic regressions revealed a significant positive association between commute satisfaction and these well-being indicators. Travel mode, travel attitudes, student type, and age were found to be statistically significant correlates of commute satisfaction. These findings suggest post-secondary administrators and urban planners can improve student well-being by implementing policies to increase commute satisfaction.

Key words: travel satisfaction; subjective well-being; travel mode; post-secondary students; commute

Acknowledgements

A sincere thanks to my supervisor Dr. Raktim Mitra for his guidance, insight, and support throughout this process, pushing me to think critically and not be afraid to challenge myself. I benefitted immensely from your steady hand.

I would also like to thank my second reader Dr. Matti Siemiatycki for taking the time to provide insightful comments that made this MRP better.

Thanks to Davin McCully, Karina Maynard, and Igor Samardzic for showing me the ropes when I joined the StudentMoveTO team.

Thanks to the StudentMoveTO team and everyone that helped me promote the survey at Ryerson: Inara, Matt, Monika, Leandro, Paul, Ellen, Taranjeet, and Danielle.

Thanks to my classmates for being wonderful people.

Thanks to my family for their unconditional support.

Thanks to Dave for letting me hog the kitchen table for schoolwork without complaint.

Table of contents

Table of contents continued

List of tables

List of figures

1.0 - Introduction

In recent years, transportation researchers have paid greater attention to the travel behaviours of post-secondary students, who constitute a large though often understudied subpopulation with unique needs (Khattak et al., 2011; Limanond et al., 2011; Moniruzzaman & Farber, 2018; Nash & Mitra, 2019; Whalen et al., 2013). Much of this research has focused on the choice of travel mode in the commute to and from campus (Danaf et al., 2014; Hasnine et al., 2018; Khattak et al., 2011; Moniruzzaman & Farber, 2018; Nash & Mitra, 2019; Shannon et al., 2006; Whalen et al., 2013; Zhou, 2012). A smaller literature has explored student travel satisfaction with their commute trips (Handy & Thigpen, 2019; Páez & Whalen, 2010; Schneider & Willman, 2019; St-Louis et al., 2014); however, little is known about the effect of commute satisfaction on broader student well-being.

The positive effect of travel on well-being is understood to be largely indirect through enabling activities that provide positive emotions and satisfaction in the short-term and bring meaning to one's life in a broader, longer-term sense (Bergstad et al., 2011; De Vos et al., 2013; De Vos & Witlox, 2017; Ettema et al., 2010). Travel satisfaction – both with commute trips and with overall day-to-day travel experience– plays a role by determining if travel is undertaken to pursue these activities (De Vos et al., 2013). For post-secondary students, participating in campus life – attending classes, engaging in extra- or co-curricular activities – is a critical component of student success, particularly through the creation of on-campus social networks that are important for student persistence and academic achievement (Coutts et al., 2018; Krause, 2007; Leveson et al., 2013; Martin, 2009). Unfortunately, long commutes can make it difficult for students to participate fully. Social challenges faced by commuter students are well-documented (Clark, 2006; Grayson, 1997; Krause, 2007;

Leveson et al., 2013), and recent research has found commuting distance to be negatively associated with campus participation (Coutts et al., 2018) and academic achievement (Kobus et al., 2015). However, within this literature, commute satisfaction remains an unexplored link.

This Major Research Paper (MRP) seeks to complement and build on previous findings by exploring the relationship between commute satisfaction and various campus participation and academic outcomes, used here as measures of student well-being. Specifically, it investigates two questions:

1. Do students perceive their commute to be a barrier to campus participation and academic achievement, and does this perception vary based on commute satisfaction?
2. What factors are associated with student commute satisfaction?

The hypothesis is that greater commute satisfaction has a positive correlation with well-being outcomes and that sociodemographic characteristics, commute mode, and travel attitudes contribute to commute satisfaction. These questions are explored using student travel data from Ryerson University, a mid-sized university in downtown Toronto, Ontario, Canada. Data came from a large transportation survey of students at six universities and four colleges in the fall of 2019 called StudentMoveTO. In total, survey data from 1,931 Ryerson students was analyzed.

The goal of this research is to gain a better understanding of how student commute satisfaction relates to increased campus participation and academic success and, by extension, student well-being. Improved student well-being brings myriad benefits: students are more likely to achieve their full potential, contribute to vibrant and successful post-secondary campuses, and become engaged citizens. As job and knowledge hubs,

successful post-secondary institutions also benefit the cities and regions in which they are located. These findings suggest post-secondary administrators and urban planners can improve student well-being by implementing policies to increase commute satisfaction.

The remainder of this paper is organized as follows: Section 2.0 contextualizes this research by reviewing literature related to commuting and well-being, determinants of travel/commute satisfaction, student travel behaviour, and the impacts of commuting on campus participation and academic achievement. Section 3.0 describes the methodological approach used in this study including the conceptual model, data source, and variables explored in statistical models. Section 4.0 presents the results of the statistical analyses conducted to address the two research questions. These results are discussed in the context of existing literature regarding commute satisfaction and well-being in Section 5.0. Finally, Section 6.0 discusses potential implications of the findings for post-secondary institutions and urban planning policy.

2.0 Literature review

This section reviews relevant existing literature on travel satisfaction and student travel and well-being. Specifically, it considers the following themes: (1) subjective well-being and travel satisfaction, (2) correlates of travel satisfaction, (3) student travel satisfaction, and (4) transportation, campus participation, and student success. A review of the literature finds an established body of research on travel satisfaction and on student success, and an emerging body of research on student travel behaviour. However, it also reveals these topics are rarely considered or addressed concurrently.

2.1 – Subjective well-being and travel satisfaction

Subjective well-being (SWB) is defined as "the degree to which an individual positively evaluates the overall quality of their lives" (Ettema et al., 2010, p. 725). It consists of four components: (1) positive affect, or the presence of positive feelings, (2) lack of negative affect, or the absence of negative feelings, (3) satisfaction with personal domains, such as health, relationships, job, etc., and (4) overall life satisfaction (Diener, 2000). Each component corresponds to well-being experienced over different time horizons. Positive and negative affect are feelings contributing to short-term well-being, domain satisfaction contributes to medium-term well-being, and overall life satisfaction contributes to long-term well-being (De Vos & Witlox, 2017). Affective components are associated with *hedonic* well-being, or short-term well-being derived from maximizing positive experiences and satisfying immediate needs. Domain and life satisfaction are associated with *eudaimonic* well-being, a longer-term and higher-level understanding of well-being that emphasizes personal growth and living a meaningful life beyond the satisfaction of immediate needs (De Vos et al., 2013).

A growing body of research has examined the impact of travel on well-being. Findings indicate travel affects well-being both directly and indirectly through travel satisfaction and by enabling activities (Bergstad et al., 2011; De Vos et al., 2013; De Vos & Witlox, 2017; Ettema et al., 2010). Travel satisfaction can refer to trip satisfaction as well as satisfaction with daily travel patterns (De Vos & Witlox, 2017). Trip satisfaction is an evaluation of a single trip based positive or negative emotions experienced during travel and the travel experience overall. As such, it measures the direct effect of travel on short-term well-being. Satisfaction with daily travel is an overall evaluation of past travel experiences and constitutes a personal domain. As such, it measures the direct effect of travel on medium-term well-being.

Travel also impacts well-being indirectly by enabling participation in activities (Bergstad et al., 2011; De Vos et al., 2013; Ettema et al., 2010) though this relationship is complex and understudied in the current literature. Participating in activities has the ability to contribute to both short- and long-term well-being. For example, socializing with friends can contribute to short-term well-being by providing immediate positive feelings, but it can also contribute to long-term well-being by helping to develop and maintain fulfilling relationships. While travel facilitates these activities, it can also affect *how* they are completed. For example, studies have found that stress experienced during or caused by the commute can negatively impact task performance at the destination (Ettema et al., 2010; Schaeffer et al., 1988; Wener et al., 2005). Stressful commutes from work to home have also been shown to negatively impact employee recovery following busy workdays (Hooff, 2015). In addition, low satisfaction with daily travel may discourage people from traveling to participate in activities more generally (De Vos et al., 2013). Both outcomes – poor activity performance and avoiding activities altogether – have negative implications for

short-term (i.e., *hedonic*) and, importantly, long-term (i.e., *eudaimonic*) well-being. Therefore, while travel satisfaction – both trip satisfaction and satisfaction with daily travel – is important for well-being in and of itself, it is perhaps more importantly understood as a contributor to short- and long-term well-being through activity participation. This relationship is understudied in the current literature and is a primary focus of this MRP research.

2.2 – Correlates of travel satisfaction

2.2.1 – Trip characteristics

Travel satisfaction is most commonly explained in terms of trip characteristics such as duration, mode, and purpose (De Vos & Witlox, 2017). Longer trips stemming from distance and/or congestion have been found to be negatively associated with travel satisfaction (De Vos et al., 2013; Ettema et al., 2011; Ory & Mokhtarian, 2005; St-Louis et al., 2014). A possible explanation for this is that longer commutes are more stressful and unpredictable (Evans et al., 2002; Gottholmseder et al., 2009). The type of activity at the destination also affects satisfaction. Trips to work or school are associated with lower satisfaction while travelling to recreational or social activities is found to increase satisfaction (E. A. Morris, 2015; Ory & Mokhtarian, 2005).

Several studies have found walking and cycling (often referred to as active transportation) to be the most satisfying travel modes and public transit to be the least satisfying (De Vos et al., 2016; Friman et al., 2017; Handy & Thigpen, 2019; E. Morris & Guerra, 2015; Ory & Mokhtarian, 2005; Páez & Whalen, 2010; St-Louis et al., 2014; Ye & Titheridge, 2017). Findings on automobile satisfaction are mixed. Studies have found car users to be more satisfied than transit users (Ettema et al., 2011), but less satisfied than walkers or cyclists (De Vos et al., 2016; Ory & Mokhtarian, 2005; Ye & Titheridge, 2017).

Drivers were also the least satisfied users in a study of commuters in Portland, Oregon, though car passengers were as satisfied as transit users (Singleton, 2019). Singleton (2019) examined the effect of mode on four factors associated with broader eudaimonic well-being: autonomy, health, security, and confidence. Walkers and cyclists reported higher levels of confidence and health than motorized modes, while users of motorized modes felt more secure. Transit riders and car passengers ranked lower on autonomy than other modes. Walking and cycling have also been found to be positively associated with overall life satisfaction (Friman et al., 2017; E. A. Morris, 2015).

2.2.2. – Personal attitudes and preferences

Personal attitudes and preferences have also been found to influence travel satisfaction. People that enjoy travelling or view it as useful are more likely to report greater travel satisfaction, while those who view travel solely as a means to reach a destination are less satisfied (Singleton, 2019; St-Louis et al., 2014; Ye & Titheridge, 2017). Additionally, studies have shown that travelers are more satisfied when they are able to use their preferred travel mode (De Vos et al., 2016; St-Louis et al., 2014). These mode preferences can be shaped at least in part by personal values. For example, caring about the environment has been positively associated with liking public transit and active modes of transportation, as well as greater commute satisfaction (Ory & Mokhtarian, 2005; Ye & Titheridge, 2017). However, most of the current literature examines travel satisfaction through attitudes towards travel in general and travel mode preferences only. The influence of attitudes towards elements of travel – speed, flexibility, cost – independent of mode and liking travel liking is understudied.

2.2.3 – Sociodemographic characteristics

Sociodemographics are most often included in travel satisfaction research as control variables, though they sometimes yield statistically significant findings. In particular, older travelers are more likely to be satisfied with their travel (Bergstad et al., 2011; De Vos et al., 2016; Friman et al., 2017; St-Louis et al., 2014; Ye & Titheridge, 2017). Sociodemographics are associated with travel mode more than overall travel satisfaction. For example, Ye & Titheridge (2017) found income level was positively associated with car satisfaction, negatively associated with walking satisfaction, but not associated with overall travel satisfaction.

2.2.4 – Overall life satisfaction

Recent literature also suggests one's overall level of life satisfaction can contribute to their travel satisfaction. For example, it has been theorized that high life satisfaction may cause individuals to perceive their travel more favourably in general (De Vos & Witlox, 2017). However, this relationship is bidirectional to a certain extent as travel satisfaction itself is a domain that contributes to overall life satisfaction.

2.3 – Student travel satisfaction

Post-secondary students' travel behaviour is an area of increasing interest in transportation research as students have unique needs and are often underrepresented in traditional transportation surveys (Khattak et al., 2011; Limanond et al., 2011; Moniruzzaman & Farber, 2018; Nash & Mitra, 2019; Whalen et al., 2013). Most of this research has explored travel mode choice and highlighted that these young adults tend to rely heavily on transit and active travel modes, especially compared to working-age adults

(Hasnine et al., 2018; Khattak et al., 2011; Moniruzzaman & Farber, 2018; Nash & Mitra, 2019; Shannon et al., 2006; Zhou, 2012).

Research into post-secondary students' travel satisfaction is emerging but limited. Existing literature has found students tend to be more satisfied when using active travel modes and less satisfied with driving and public transit, and with buses in particular (Ettema et al., 2011; Handy & Thigpen, 2019; Páez & Whalen, 2010; Schneider & Willman, 2019; St-Louis et al., 2014; Whalen et al., 2013). Travel satisfaction is also negatively associated with trip duration (Ettema et al., 2011; Schneider & Willman, 2019; St-Louis et al., 2014), however one study found active travelers actually wanted longer commutes (Páez & Whalen, 2010).

Attitudes affecting satisfaction include travel comfort, social nature of travel, and the perceived value of travel, though attitudes varied depending on mode (Handy & Thigpen, 2019; Páez & Whalen, 2010; St-Louis et al., 2014; Whalen et al., 2013). Finally, students also tend to be less satisfied with travel overall when compared to other populations such as faculty (Handy & Thigpen, 2019) or non-students (Singleton, 2019).

Limitations within the current research include the following. First, when students are part of a larger survey group, most reported results are often aggregated and not student-specific (Handy & Thigpen, 2019; Schneider & Willman, 2019; St-Louis et al., 2014). Other studies asked respondents to evaluate their travel satisfaction for *hypothetical* travel scenarios, not satisfaction based on an actual travel experience (Ettema et al., 2011). Additionally, attitudinal findings are often based on mode preferences, for example, "I like driving" or "I would like to cycle more", or attitudes towards travel in general, for example, "travel time is generally wasted time" or "I use commute time productively" (Handy & Thigpen, 2019; Páez & Whalen, 2010; St-Louis et al., 2014; Whalen et al., 2013). Few have

investigated the *elements* of travel that students value, for example, speed, flexibility, or cost, independent of mode or general travel attitudes. A final limitation is in research intent. Students are often a proxy for the general public and studied because they are a population that researchers have access to, not necessarily because they want to understand them specifically. Taken together, this leaves an incomplete understanding of student travel satisfaction.

2.4 – Transportation, campus participation, academic success, and well-being

Limited literature exists examining the direct impact of commuting on post-secondary students' well-being. Kobus et al. (2015) found academic achievement was negatively associated with commute time for university students in the Netherlands. López, Turley, and Wodtke (2010) found non-commuter students in the U.S. had higher GPAs than commuter students, but only if they were black or attended a liberal arts college. Leveson et al. (2013) found commute time was negatively associated with student persistence and the strongest predictor of whether a student wanted to leave university in Australia. Looking at other student groups, high-school students in Australia were less likely to pursue post-secondary education the further they lived from a campus (Parker et al., 2016). Studies of secondary students in Norway (Falch et al., 2013) and grade six students in Brazil (Tigre et al., 2017) also found commute distance to be negatively associated with academic performance.

Long commutes have also been found to discourage coming to campus (Coutts et al., 2018; Kobus et al., 2015). While studies of the impact of absenteeism on academic performance are inconclusive (Andrietti & Velasco, 2015), current research suggests absenteeism resulting from long commutes has negative implications for student well-being by reducing opportunities for campus participation generally, including attending classes and involvement in extra- or co-curricular activities (Coutts et al., 2018). This is of critical

18

importance as campus participation can facilitate the creation of on-campus social networks that are associated with better student outcomes (Coutts et al., 2018; Leveson et al., 2013; Martin, 2009). To the knowledge of the author, the role of commute satisfaction in encouraging or discouraging campus participation has yet to be addressed in this emerging literature.

2.5 – Conceptual model of student commute satisfaction, campus participation, and well-being

A conceptual model of the relationship between student commute satisfaction, campus participation/academic success, and well-being was developed based on earlier conceptualizations and findings about the influence of travel on well-being through enabling participation in activities (Bergstad et al., 2011; De Vos et al., 2013; De Vos & Witlox, 2017; Ettema et al., 2010). Specifically, the model is a simplification of the theoretical conceptualization by De Vos et al. (2013) that emphasizes that travel satisfaction indirectly influences long-term well-being by encouraging or discouraging participation in activities that contribute to long-term well-being (see Section 2.1).

In my conceptualization (Figure 2-1), I hypothesize that sociodemographic characteristics, commute characteristics (duration, mode), and individual travel motivations/attitudes affect commute satisfaction. Satisfaction with commute affects the degree to which students participate in campus activities by encouraging or discouraging travel to campus, as well as a student's satisfaction with their academic success. I also theorize participating in campus activities and academic success are directly linked to long-term well-being based on the literature related to student success and on-campus social networks (Coutts et al., 2018; Leveson et al., 2013; Martin, 2009). This conceptualization also highlights that campus participation may affect commute satisfaction through spillovers

effects of positive (negative) feelings experienced on-campus, though I theorize that this influence is weaker than commute satisfaction on campus participation. Finally, the model acknowledges that sociodemographic characteristics can also influence long-term well-being independent of commute satisfaction.
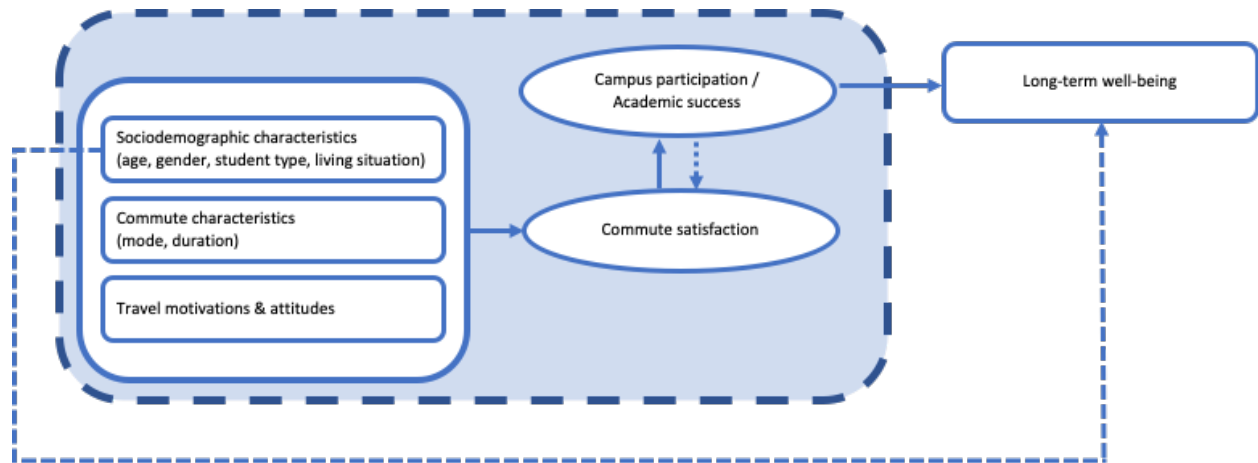
Figure 2 - 1
Conceptual model of relationship between commute satisfaction, campus participation, academic success, and well-being

3.0 Methodology

This section outlines the methodology used to answer the two research questions. It begins by describing the study area and geographic and commuting context for this research. Second, it describes the data collection process and variables used in the statistical analysis. It concludes by describing the three stages of statistical analysis.

3.1 Study area

Ryerson University is located in downtown Toronto, Ontario, the largest city and economic capital of Canada and the centre of the Greater Toronto and Hamilton Area (GTHA), the largest urban area in the country with a population of 6.9 million over approximately 8,200 kilometres (Statistics Canada, 2017). Ryerson is the third-largest post-secondary institution in the GTHA based on an enrollment of approximately 47,300 students (Universities Canada, n.d.). The university is located in a dense, mixed-use, and walkable neighbourhood and is well-served by local and regional transit. Specifically, the campus can be accessed by a subway line, two streetcar routes, and three bus routes. The regional Union Station GO train and GO bus terminal is located approximately three subway stops south of the campus and is the terminus for multiple train and bus routes serving the GTHA (Figure 3-1). The university can be considered a commuter campus as only approximately 3% of its students can be accommodated in university-operated residences (Ryerson University, n.d.a) This is supported by previous research that found Ryerson students had the longest one-way commute time of four major universities in the GTHA (StudentMoveTO, 2016).

Table 3 - 1

Local and regional transit serving Ryerson University

Mode	Route
Local	
Subway	Line 1
Streetcar	505 Dundas
	506 College/Carlton
Bus	6 Bay
	141 Mount Pleasant Express
Regional	
GO Train	Multiple routes
GO Bus	Multiple routes
UP Express	UP Express
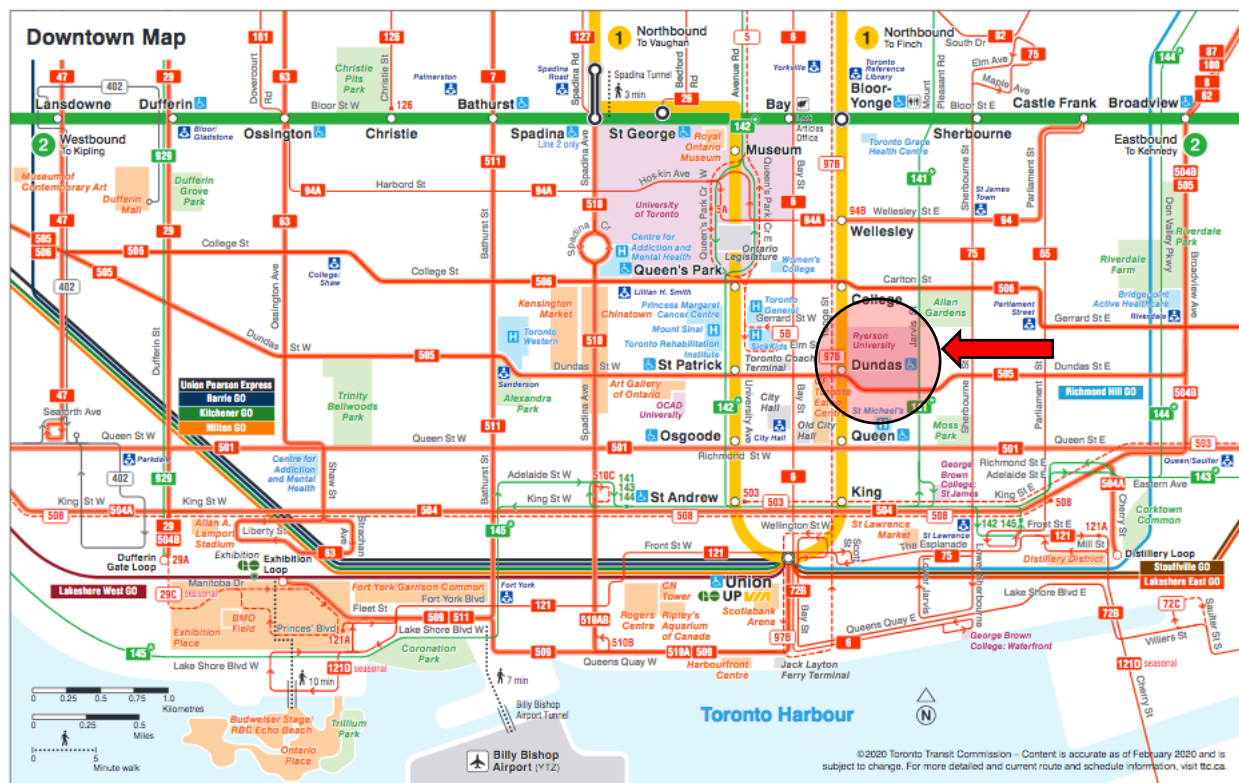
Figure 3 - 1

Ryerson University and surrounding transit connections (source: www.ttc.ca)

3.2 Data collection

Data for this study came from the 2019 StudentMoveTO survey of student travel behaviour in the GTHA. Ten post-secondary institutions participated in the survey representing over 328,000 students across 21 campuses in five municipalities in both urban and suburban contexts. Of the ten institutions, six were universities and four were colleges. To the knowledge of the author, the survey represents one of the largest studies of student transportation ever conducted.

The survey was conducted online and ran from October 1, 2019 to November 30, 2019. Email invitations with a link to the survey were sent to institutional emails of all students at participating institutions, including full-time, part-time, and continuing education students. Each student received two emails: an email with the survey invitation and a follow-up email prompting them to complete the survey one week after the initial invitation. Emails were staggered so students received survey invitations throughout the survey period to get a random sample of travel behaviour to avoid sampling bias. Gift cards to institutional bookstores were offered as an incentive to complete the survey. The survey was also promoted via on-campus promotion (digital and physical posters, tabling/information booths) and through targeted advertising on social media channels (Facebook, Instagram). A total of 19,092 students participated in the survey representing a response rate of 5.8%.

The survey collected information on the sociodemographic characteristics of students (age, gender, student type, etc.), as well as commute characteristics (transportation mode, frequency of commuting), the effect of commuting on campus life, travel motivations, commute satisfaction, and subjective well-being. In addition, students were also asked to complete a one-day commute diary documenting all trips made during

the day before receiving the survey. This commute diary data was not analyzed in this MRP study.

A total of 4,091 Ryerson students participated in the survey (8.6% response rate), however only responses that answered ALL survey questions relevant to the research objectives (see Section 1.0) were included in the subsequent analysis for consistency and statistical rigour. Answers left blank as well as those deemed not relevant to outcomes were removed. Cleaning resulted in a dataset with 1,931 unique responses (4.1% response rate).

3.3 Variables

3.3.1 Campus participation and academic success outcomes

Several questions in the survey focused on the impact of commuting on a student's campus participation and academic success as measures of their well-being. As discussed in Section 2.0, campus participation and academic success contribute to student well-being by helping them maximize their post-secondary experience to achieve their longer-term goals. Students were asked to answer "yes" or "no" to the following five statements:

- My commute discourages me from coming to campus

- My commute is a barrier to participating in university activities

- My commute is a barrier to cocurricular activities

- I pick my courses based on my commute

- My commute is a barrier to my academic success

Responses to these questions formed the dependent variables for a statistical analysis of well-being outcomes. Blank responses for any of the five questions were removed from the dataset. It is important to note that "academic success" is a self-reported measure whose definition will vary with each student. For example, a student that desires A's and receives

B's and a student that desires B's and receives C's may both report feeling unsuccessful even though B's are objectively higher than C's. On the other hand, a student that desires *and* receives B's may report feeling successful even though they did not receive the highest possible grade. As such, responses to this question represent subjective evaluations of the impact of commute on academic performance, not objective measures like grade point average. This recognizes that the impact of academic performance on well-being depends more on the value that a student places on grades than the grades themselves.

3.3.2 Commute satisfaction

Survey questions related to commute satisfaction were informed by the Satisfaction with Travel Scale (STS) developed by Ettema et al. (2011). The STS is a travel-specific measure of *hedonic* well-being that measures both affective and cognitive components of daily travel by asking respondents to rank how they felt during travel (affect) as well as their overall travel experience (cognitive) on a nine-point Likert scale. The STS approach has been used widely in recent research and in travel studies around the world, including Canada (see Singleton, 2019). The original STS asks participants to respond to nine statements, six related to feelings experienced during a trip and three related to the evaluation of the overall trip experience. The StudentMoveTO survey used a modified version of the STS focusing only on the three statements related to the overall trip experience, in this case, the student's commute to campus. Students were asked to respond to the following three questions on a five-point Likert scale based on their commute to campus the previous day:

- I had the _____ travel (worst/bad/average/good/best)
- Quality of travel was _____ (extremely poor/poor/average/good/excellent)
- My travel worked _____ (very poorly/poorly/average/well/very well)

Responses were coded 1 to 5 from negative experience to positive experience, and an unweighted sum of responses was used to establish an overall commute satisfaction score. Scores were then z-standardized and coded categorically as "unsatisfied", "somewhat satisfied", or "satisfied". More specifically, students with z-scores less than one standard deviation below the mean were deemed "unsatisfied" while z-scores greater than one standard above the mean were deemed "satisfied". Students with z-scores between one standard deviation above or below the mean were deemed "somewhat satisfied".

Responses to these questions formed the dependent variable for a statistical analysis of commute satisfaction. Blank responses for any of the three questions were removed from the dataset.

3.3.3 Travel attitudes

A series of survey questions focused on travel motivations to understand student travel priorities. Students were asked to respond to eight statements on a five-point Likert scale ranging from "strongly disagree" to "strongly agree":

- It is important for me to reach my destination as quickly as possible

- It is important for me to have flexibility with regard to when I am starting a trip

- It is important for my trip time to be predictable

- It is important for me to reach my destination in the most cost-effective way possible

- It is important for me to make environmentally friendly transportation choices

- It is important for me to be physically active

- When traveling, it is important for me to minimize my exposure to rain or snow

- When traveling, it is important for me to minimize my exposure to extreme hot or cold

Responses to these questions were coded from 1 to 5 to represent "strongly disagree" to "strongly agree". Blank responses were removed from the dataset.

A principal component analysis (PCA) was conducted using RStudio software to reduce the number of dimensions relating to attitudinal variables. Kaiser-Meyer-Olkin's test of sampling adequacy was 0.69, and Bartlett's test of sphericity was significant at < .001. Though the KMO was only a moderate fit, both results indicated the data was suitable for factorization. The PCA was conducted with a varimax rotation to maximize the sum of the variances of the squared loadings. The results of this analysis suggested three "components" that cumulatively explained 69% of the variations in the data (Table 3-2). Two of these factors had eigenvalues greater than one while the third had an eigenvalue of 0.79.

Following this, a three-factor factor analysis was conducted to identify three clearly distinguishable "factors" around which the factor loadings for eight attitudinal variables converged. The factors were named weather exposure, travel efficiency, and environment and active (Table 3-2). These three factors were subsequently included as independent variables in the statistical analysis.

Table 3 - 2
Results of factor analysis

Variable	Weather averse	Commute efficiency	Environment and active
"It is important for me to reach my destination as quickly as possible"		0.637	
"It is important for me to have flexibility with regard to when I'm starting a trip"		0.526	
"It is important for my trip time to be predictable"		0.559	
"It is important for me to reach my destination in the most cost-effective way possible"		0.424	
"It is important for me to make environmentally friendly transportation choices"			0.960
"It is important for me to be physically active"			0.388
"When travelling, it is important for me to minimize my exposure to rain or snow"	0.819		
"When travelling, it is important for to minimize my exposure to extreme hot or cold"	0.877		

Note: Kaiser-Meyer-Olkin test of sampling adequacy is 0.69; Bartlett test of sphericity is < .001

3.3.4 Commute mode

Students were asked to report their typical fall commute mode from a list of 23 options. Responses were grouped into the following five categories:

- Walk

- Cycle (including bikeshare)

- Transit - local (including local bus, streetcar, subway/RT, paratransit)

- Transit - regional (including GO bus, GO train)

- Car (either as a driver or passenger; including accessibility adapted vehicles, taxis, rideshare, motorcycles, mopeds, scooters)

Students with blank responses as well as those listing "Other" and "I do not commute to campus" were removed from the analysis.

3.3.5 Sociodemographic characteristics

Questions related to age, gender, student type, and living situation were included as independent variables in the statistical analysis, primarily for the purpose of control. Blank responses, ages under 17 years old, and student types listed as "Other" were removed from the dataset.

3.4 Statistical analysis

A three-stage statistical analysis was conducted to investigate the links between commute satisfaction and campus participation based on the conceptual model described in Section 2.5.

First, chi-square and t-tests were used to determine if there was a statistically significant difference in campus participation outcomes depending on age, gender, student

type, living situation, and commute satisfaction levels. Results of these tests showed

statistically significant difference for all variables in at least one of the campus participation

or academic success questions. All variables were included in the multivariate statistical

analysis.

Second, based on the hypothesis that commute satisfaction is positively associated

with campus participation and academic success, five binomial logistic regressions were

conducted using RStudio statistical software to determine statistically significant correlates

of the campus participation and academic success outcomes included in the survey.

Explanatory variables included age (no reference), gender (ref = male and other), student

type (ref = undergraduate), living situation (ref = live alone / with roommates), and commute

satisfaction (ref = somewhat satisfied). Regression coefficients (β) show the log-odds of a

student answering "yes" to the campus participation and academic success questions for

every one-unit change in the explanatory variable. Coefficients are also expressed as Odds

Ratios (OR = e^β) to represent the likelihood or the odds of a student responding "yes" to the

campus participation and academic success questions for every one-unit change in the

explanatory variable.

Finally, having established a correlation between commute satisfaction and campus

participation and academic success, an ordinal logistic regression was conducted in

RStudio to determine statistically significant correlates of commute satisfaction. Ordinal

logistic regressions are appropriate to use when the dependent variable is ordinal in nature,

that is, the response values follow a rank order, but the distance between the values is not

known (Williams, 2016). In the case of this analysis, "unsatisfied", "somewhat satisfied", and

"satisfied" represent a ranked order of response values for commute satisfaction.

Transportation mode and travel-related attitudinal factors were added to the model as

explanatory variables. Sociodemographic variables included in the model were age, gender, student type, and living situation. Regression coefficients (β) of an ordinal logistic regression show the log-odds of a student reporting one higher level of commute satisfaction for every one-unit change in the explanatory variable. Coefficients are also expressed as Odds Ratios (OR = e^{β}) to show the odds of a student reporting a higher commute satisfaction for every one-unit change in the explanatory variable.

4.0 Results

This section presents the results of the descriptive and statistical analyses conducted in this MRP. First, it presents descriptive statistics of sample characteristics, campus participation and academic success, and commute satisfaction responses. Next, it presents the results of binomial logistics regressions to determine correlates of campus participation and academic success outcomes. Finally, it presents the results of the ordinal logistic regression to determine correlates of commute satisfaction.

4.1 Descriptive statistics

4.1.1 Sample characteristics

The average age of students was 22.4 with a standard deviation of 5.6 years. Of these, 69% identified as female and 85% were undergraduate students. Females are likely overrepresented and undergraduate students are slightly underrepresented in the survey when compared to the Ryerson population as a whole (Table 4-1) (Ryerson University, n.d.b). This limitation will be discussed in a later section of this paper. Ryerson University does not track continuing education students in terms of full-time equivalent enrollment (FTEE) as they do undergraduate and graduate students, which is why they are not included for the sake of comparison between sample and full student populations in Table 4-1. When they are included, they constitute 4% of survey respondents. Seventy-eight percent of respondents lived either with family or a partner, highlighting the "commuter campus" characteristics of Ryerson University (Table 4-1). The majority of students commute to campus via local (55%) and regional (23%) transit (Table 4-1). Active travel constitutes the next largest mode share with 17% of students either walking or biking to campus (Table 4-1). Only 5% of students commute to campus by car (Table 4-1).

Table 4 - 1
Sample characteristics (n = 1,931)

	Survey respondents		Ryerson University	
Variable	Mean (S.D.)	%	Mean	%
Age (Years)	22.4 (5.6)		21.6	
Gender				
Male		30%		44%
Female		69%		56%
Non-binary / third gender		1%		-
Prefer not to answer		1%		-
Student type				
Undergraduate		88%		93%
Graduate		12%		7%
Continuing education		See Note		-
Household				
Live alone		7%		
Live with roommates		15%		
Live with family/parents		68%		
Live with partner		8%		
Live with host family or at friend's house		1%		
Usual commute mode to campus				
Walk		14%		
Bike		3%		
Transit - Local		55%		
Transit - Regional		23%		
Car		5%		

Note: When continuing education students are included, the breakdown of student type is as follows: undergraduate (85%), graduate (11%), continuing education (4%)

4.1.2 Campus participation and academic success outcomes

A majority of students agreed their commute discouraged them from coming to campus (51%) and participating in university activities (70%), was a barrier to their co-curricular experience (55%), and picked their courses based on their commute (57%) (Figure 4-1). Approximately 40% reported their commute was a barrier to their academic success (Figure 4-1).

Statistically significant difference in responses for almost all questions was found across various age, student type, and household groups, and across students with different commute satisfaction levels (Table 4-2). Younger students, undergraduate students, and students that live with their family or partner reported their commute negatively affected all

campus participation and academic success outcomes. Females were more likely to report picking courses based on their commute (61%) (Table 4-2). Responses to other questions differed by gender, but not at statistically significant levels. Unsatisfied students overwhelmingly reported their commute had a negative impact on their campus participation (91%) and that their commute was a barrier to their academic success (69%) (Table 4-2). Conversely, satisfied students did not see their commute as a barrier to campus participation (46%) and reported their commute was not a barrier to their academic success (82%) (Table 4-2).

4.1.3 Commute satisfaction

The majority of students are somewhat satisfied with their commute based on their overall commute satisfaction score (62%) (Table 4-3). As described in Section 3.0, commute satisfaction was defined and measured based on normalized z-scores. "Satisfied" students had z-scores greater than one standard deviation above the mean, "unsatisfied" students had z-scores lower than one standard deviation from the mean, and "somewhat satisfied" students had z-scores between one standard deviation above or below the mean. Normalization results in a definition of commute satisfaction that is *relative* and not absolute, that is, "satisfied" students are more satisfied than "somewhat satisfied" students, not necessarily satisfied in absolute terms. Male and other students, graduate students, and those that live alone or with roommates reported greater commute satisfaction. Students that walk, cycle, or take regional transit to campus also reported higher commute satisfaction.

Table 4 - 2

Campus participation and academic success outcomes (n = 1,931)

	Commute discourages coming to campus			Commute discourages participating in university activities			Commute is a barrier to cocurricular experience			Pick courses based on commute			Commute is a barrier to academic success		
	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
All	50.8%	49.2%	<.001	69.7%	30.3%	<.001	54.9%	45.1%	<.001	57.4%	42.6%	<.001	39.3%	60.7%	<.001
Average age	21.6	23.2		21.9	23.4		21.8	23.0		21.8	23.2		21.7	22.8	
Gender															
Male and other	49.1%	50.9%	.349	65.0%	35.0%	.003	53.2%	46.8%	.328	49.8%	50.2%	<.001	41.0%	59.0%	.033
Female	51.5%	48.5%		71.8%	28.2%		55.7%	44.3%		60.9%	39.1%		38.5%	61.5%	
Student type															
Undergraduate	53.1%	46.9%	<.001	71.6%	28.4%	<.001	56.8%	43.2%	<.001	60.8%	39.2%	<.001	41.8%	58.2%	<.001
Graduate	35.0%	65.0%		56.2%	43.8%		40.6%	59.4%		34.6%	65.4%		21.7%	78.3%	
Continuing education	43.5%	56.5%		65.2%	34.8%		55.1%	44.9%		49.3%	50.7%		36.2%	63.8%	
Household															
Live alone / with roommates	26.6%	73.4%	<.001	40.4%	59.6%	<.001	29.5%	70.5%	<.001	33.9%	66.1%	<.001	20.3%	79.7%	<.001
Live with family / partner	58.1%	41.9%		78.5%	21.5%		62.6%	37.4%		64.5%	35.5%		45.0%	55.0%	
Commute satisfaction															
Unsatisfied	77.8%	22.2%	<.001	91.1%	8.9%	<.001	76.8%	23.2%	<.001	75.9%	24.1%	<.001	68.5%	31.5%	<.001
Somewhat satisfied	56.4%	43.6%		76.2%	23.8%		60.7%	39.3%		61.2%	38.8%		43.7%	56.3%	
Satisfied	27.2%	72.8%		46.3%	53.7%		76.8%	23.2%		41.5%	58.5%		18.0%	82.0%	

Student campus participation and academic success outcomes

	Yes	No
Commute discourages coming to campus	50.8%	49.2%
Commute discourages participating in university activities	69.7%	30.3%
Commute is a barrier to cocurricular experience	54.9%	45.1%
Pick courses based on commute	57.4%	42.6%
Commute is a barrier to academic success	39.3%	60.7%
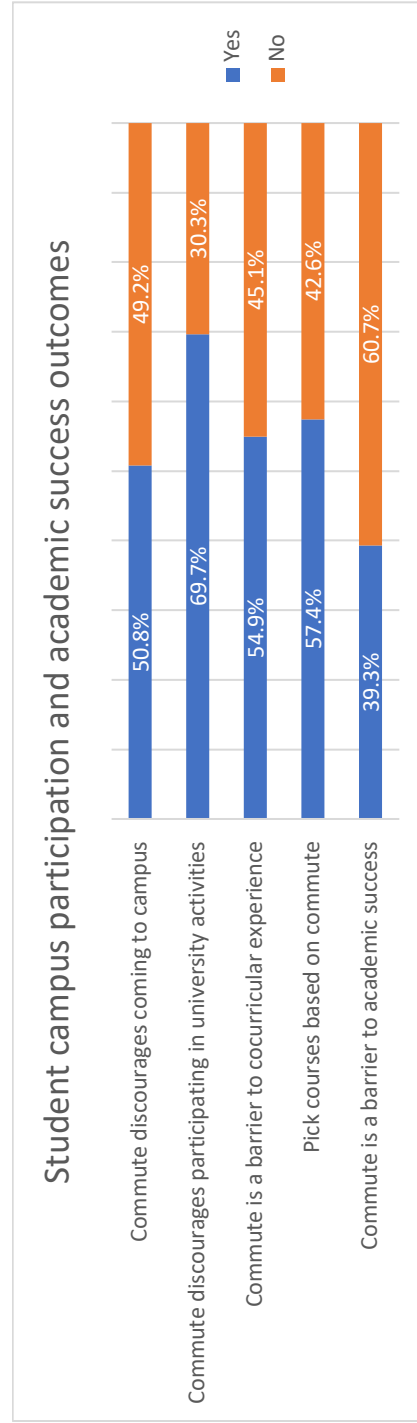
Figure 4 - 1:

Student campus participation and academic success outcomes (n = 1,931)

Table 4 - 3
Commute satisfaction descriptive statistics (n = 1,931)

	Unsatisfied	Somewhat satisfied	Satisfied
All	10.5%	62.4%	27.1%
Demographic			
Average age	22.2	22.0	23.4
Gender			
Male and other	11.9%	58.2%	29.9%
Female	9.9%	64.3%	25.8%
Student type			
Undergraduate	10.5%	65.0%	24.4%
Graduate	10.6%	43.8%	45.6%
Continuing education	10.1%	58.0%	31.9%
Household			
Live alone / with roommates	6.9%	54.9%	38.2%
Live with family / partner	11.6%	64.7%	23.7%
Mode			
Walk	3.0%	45.3%	51.7%
Cycle	3.2%	54.0%	42.9%
Transit - Local	12.9%	67.4%	19.7%
Transit - Regional	8.7%	63.1%	28.2%
Car	17.7%	57.3%	25.0%
Attitudinal			
Reach destination quickly			
Agree	10.9%	62.5%	26.6%
Disagree	5.5%	61.0%	33.6%
Flexible start time			
Agree	10.5%	61.9%	27.6%
Disagree	10.6%	65.7%	23.6%
Predictable trip			
Agree	10.6%	62.0%	27.4%
Disagree	7.9%	73.0%	19.0%
Cost effective trip			
Agree	10.9%	61.9%	27.2%
Disagree	5.6%	69.6%	24.8%
Environmental choices			
Agree	9.6%	61.1%	29.3%
Disagree	12.2%	65.0%	22.8%
Physically active			
Agree	10.0%	60.2%	29.7%
Disagree	11.7%	67.7%	20.5%
Avoid rain/snow			
Agree	10.9%	64.0%	25.0%
Disagree	8.6%	54.7%	36.7%
Avoid hot/cold			
Agree	10.9%	64.0%	25.2%
Disagree	8.7%	54.7%	36.6%

4.2 – Regression results

4.2.1 – Correlates of campus participation and academic success

The first research question for this MRP was to investigate whether commute satisfaction was associated with campus participation and academic success. For this reason, binomial logistic regressions were conducted for the five outcomes related to campus participation and academic success described in Section 3.3.1 to determine if commute satisfaction was a statistically significant correlate. Results from these regressions are shown in tables 4-4 to 4-8.

First, commute satisfaction was found to have a statistically significant impact on all five campus participation and academic success outcomes. Compared to the reference group of "somewhat satisfied" students, and adjusting for variations in age, gender and student type and living situation, unsatisfied students were 2.8 times more likely to report their commute discouraged them from coming to campus (Table 4-4), 3.3 times more likely to say their commute discouraged them from participating in university activities (Table 4-5), 2.1 times more likely to say their commute is a barrier to their cocurricular experience (Table 4-6), 2.1 times more likely to pick their courses based on their commute (table 4-7), and 2.9 times more likely to say their commute was a barrier to their academic success (Table 4-8). As previously mentioned, "academic success" is a subjective evaluation of academic performance unique to each student and not related to grade point average.

Conversely, students "very satisfied" with their commute were less likely to report their commute discouraged them from coming to campus (OR = 0.33) (Table 4-4), discouraged participation in university activities (OR = 0.30) (Table 4-5) and cocurricular activities (OR = 0.36) (Table 4-6), pick their courses based on their commute (OR = 0.55) (Table 4-7), and was a barrier to their academic success (OR = 0.32) (Table 4-8).

In terms of sociodemographic variables, statistically significant odds ratios were found for age and household for all campus participation outcomes except the commute being a barrier to academic success. Negative impacts of commuting on the university experience diminished as age increased, suggesting older students are less likely to be dissatisfied with their commutes. Those that live with their family or a partner were much more likely to report a negative influence of their commute on their campus attendance (OR = 3.34) (Table 4-4), involvement (OR = 4.99) (Table 4-5), and academic success (OR = 2.85) (Table 4-8). The effect of student type on campus participation was less pronounced, however graduate students were less likely to pick their courses based on their commute (OR = 0.62) (Table 4-7) or feel their commute was a barrier to their academic success (OR = 0.56) (Table 4-8). Continuing education students reported lower campus participation outcomes, but not at statistically significant levels. Gender was found to be statistically significant for discouraging participation in university activities and picking courses based on one's commute with females more likely to report their commute discouraged their participation (OR = 1.37) (Table 4-5) and influenced their course selection (OR = 1.60) (Table 4-7).

Table 4 - 4
Summary of binomial logistic regression model for outcome 1 (commute discourages coming to campus) (n = 1,931)

Variables	Coef.	S.E.	Odds ratio	95% CI		z-stat	p-value	
Sociodemographic								
Age	-0.042	0.011	0.959	0.937	0.980	-3.721	< .001	***
Gender (ref. = Male and other)								
Female	0.052	0.108	1.053	0.853	1.302	0.484	0.628	
Student type (ref. = Undergraduate)								
Graduate	-0.145	0.183	0.865	0.603	1.237	-0.793	0.4275	
Continuing education	0.145	0.293	1.156	0.649	2.051	0.494	0.6214	
Living situation (ref. = Alone or with roommates)								
With family / partner	1.205	0.125	3.338	2.618	4.278	9.625	< .001	***
Commute								
Commute satisfaction (ref. = Somewhat satisfied)								
Unsatisfied	1.014	0.185	2.757	1.936	3.999	5.490	< .001	**
Satisfied	-1.119	0.119	0.327	0.258	0.412	-9.419	< .001	***
Null deviance:	2676.5	on 1930 degrees of freedom						
Residual deviance:	2344.1	on 1923 degrees of freedom						
AIC:	2360.1							
McFadden's Rho-sq:	0.124							
McFadden's Rho-sq (adj.):	0.120							

Note: * indicates significant at 0.1, ** indicates significant at 0.05, *** indicates significant at 0.001

Table 4 - 5
Summary of binomial logistic regression model for outcome 2 (commute discourages participating in university activities) (n = 1,931)

Variables	Coef.	S.E.	Odds ratio	95% CI		z-stat	p-value	
Sociodemographic								
Age	-0.033	0.011	0.967	0.946	0.989	-2.995	0.003	**
Gender (ref. = Male and other)								
Female	0.312	0.119	1.366	1.082	1.723	2.627	0.009	**
Student type (ref. = Undergraduate)								
Graduate	-0.005	0.188	0.995	0.690	1.442	-0.028	0.978	
Continuing education	0.219	0.311	1.245	0.682	2.320	0.704	0.482	
Living situation (ref. = Alone or with roommates)								
With family / partner	1.607	0.123	4.986	3.924	6.353	13.077	< .001	***
Commute								
Commute satisfaction (ref. = Somewhat satisfied)								
Unsatisfied	1.194	0.266	3.301	2.012	5.733	4.495	< .001	***
Satisfied	-1.212	0.120	0.298	0.235	0.376	-10.139	< .001	***
Null deviance:	2370.4	on 1930 degrees of freedom						
Residual deviance:	1962.2	on 1923 degrees of freedom						
AIC:	1978.2							
McFadden's Rho-sq:	0.172							
McFadden's Rho-sq (adj.):	0.168							

Note: * indicates significant at 0.1, ** indicates significant at 0.05, *** indicates significant at 0.001

Table 4 - 6
Summary of binomial logistic regression model for outcome 3 (commute is a barrier to co-curricular experience) (n = 1,931)

Variables	Coef.	S.E.	Odds ratio	95% CI		z-stat	p-value	
Sociodemographic								
Age	-0.028	0.011	0.973	0.952	0.993	-2.588	0.010	**
Gender (ref. = Male and other)								
Female	0.061	0.107	1.062	0.861	1.310	0.566	0.572	
Student type (ref. = Undergraduate)								
Graduate	-0.131	0.178	0.877	0.619	1.242	-0.738	0.461	
Continuing education	0.361	0.289	1.434	0.817	2.542	1.249	0.212	
Living situation (ref. = Alone or with roommates)								
With family / partner	1.270	0.121	3.560	2.812	4.526	10.466	< .001	***
Commute								
Commute satisfaction (ref. = Somewhat satisfied)								
Unsatisfied	0.760	0.183	2.138	1.506	3.085	4.162	< .001	***
Satisfied	-1.009	0.115	0.364	0.290	0.456	-8.774	< .001	***
Null deviance:	2658.0	on 1930 degrees of freedom						
Residual deviance:	2363.7	on 1923 degrees of freedom						
AIC:	2379.7							
McFadden's Rho-sq:	0.111							
McFadden's Rho-sq (adj.):	0.107							

Note: * indicates significant at 0.1, ** indicates significant at 0.05, *** indicates significant at 0.001

Table 4 - 7
Summary of binomial logistic regression model for outcome 4 (pick courses based on commute) (n = 1,931)

Variables	Coef.	S.E.	Odds ratio	95% CI		z-stat	p-value	
Sociodemographic								
Age	-0.020	0.011	0.980	0.960	1.000	-1.933	0.053	*
Gender (ref. = Male and other)								
Female	0.470	0.106	1.600	1.301	1.969	4.443	< .001	***
Student type (ref. = Undergraduate)								
Graduate	-0.740	0.177	0.477	0.337	0.674	-4.181	< .001	***
Continuing education	-0.151	0.283	0.860	0.493	1.501	-0.534	0.594	
Living situation (ref. = Alone or with roommates)								
With family / partner	1.131	0.118	3.100	2.464	3.912	9.604	< .001	***
Commute								
Commute satisfaction (ref. = Somewhat satisfied)								
Unsatisfied	0.739	0.182	2.094	1.477	3.015	4.066	< .001	***
Satisfied	-0.602	0.113	0.548	0.439	0.683	-5.339	< .001	***
Null deviance:	2634.1	on 1930 degrees of freedom						
Residual deviance:	2379.0	on 1923 degrees of freedom						
AIC:	2395.0							
McFadden's Rho-sq:	0.085							
McFadden's Rho-sq (adj.):	0.082							

Note: * indicates significant at 0.1, ** indicates significant at 0.05, *** indicates significant at 0.001

Table 4 - 8

Summary of binomial logistic regression model for outcome 5 (commute is a barrier to academic success) (n = 1,931)

Variables	Coef.	S.E.	Odds ratio	95% CI		z-stat	p-value	
Sociodemographic								
Age	-0.020	0.012	0.980	0.957	1.002	-1.770	0.077	.
Gender (ref. = Male and other)								
Female	-0.161	0.108	0.851	0.688	1.053	-1.483	0.138	
Student type (ref. = Undergraduate)								
Graduate	-0.573	0.201	0.564	0.378	0.830	-2.859	0.004	**
Continuing education	0.072	0.298	1.075	0.594	1.916	0.242	0.809	
Living situation (ref. = Alone or with roommates)								
With family / partner	1.005	0.135	2.731	2.106	3.570	7.467	0.000	***
Commute								
Commute satisfaction (ref. = Somewhat satisfied)								
Unsatisfied	1.048	0.167	2.851	2.066	3.972	6.292	<.001	***
Satisfied	-1.134	0.131	0.322	0.248	0.415	-8.647	<.001	***
Null deviance:	2587.9	on 1930 degrees of freedom						
Residual deviance:	2306.3	on 1923 degrees of freedom						
AIC:	2322.3							
McFadden's Rho-sq:	0.109							
McFadden's Rho-sq (adj.):	0.105							

Note: * indicates significant at 0.1, ** indicates significant at 0.05, *** indicates significant at 0.001

4.2.2 – Correlates of commute satisfaction

An ordinal logistic regression was conducted to determine the correlates of commute satisfaction. The results of the regression are shown in Table 4-9. Commute mode was found to have statistically significant influence on commute satisfaction. Using local transit as a reference group, students who walk (OR = 3.82), cycle (OR = 2.10) or take regional transit (OR = 1.74) to campus had a higher likelihood of reporting a higher level of satisfaction with their commute. Students who drove did not report a statistically significant difference in commute satisfaction (OR = 0.98, p = 0.950) compared to local transit.

Travel-related attitudes were also found to have statistically significant association with commute satisfaction. Students that preferred to avoid inclement weather conditions such as rain or snow or extreme heat and cold were more likely to report lower commute satisfaction (OR = 0.88). Students that placed an importance on their commute being

environmentally friendly and/or active were more likely to report greater commute satisfaction (OR = 1.19). Students that valued commute efficiency related to things such as duration, flexibility, predictability, and cost were more likely to report lower commute satisfaction (OR = 0.91), though the statistical association was weak (p = 0.112).

With regard to socio-demographic characteristics, age and student type were also found to have statistically significant effects, with older students (OR = 1.02) and graduate students (OR = 1.69) more likely to report higher levels of commute satisfaction.

Table 4 - 9
Summary of ordinal regression model for commute satisfaction (n = 1,931)

Variables	Coef.	S.E.	Odds ratio	95% CI		t-value	p-value	
Demographic								
Age	0.022	0.010	1.022	1.001	1.043	2.102	0.036	**
Gender (ref. = Male and other)								
Female	-0.068	0.103	0.934	0.763	1.143	-0.665	0.506	
Student type (ref. = Undergraduate)								
Graduate	0.527	0.168	1.694	1.219	2.356	3.137	0.002	***
Continuing education	0.111	0.276	1.118	0.650	1.915	0.404	0.686	
Living situation (ref. = Alone or with roommates)								
With family / partner	-0.040	0.137	0.961	0.735	1.257	-0.292	0.770	
Mode (ref. = Transit – Local)								
Walk	1.341	0.168	3.822	2.753	5.322	7.977	< .001	***
Cycle	0.744	0.267	2.104	1.245	3.554	2.785	0.005	**
Transit - Regional	0.556	0.120	1.744	1.380	2.205	4.651	< .001	***
Car	-0.015	0.234	0.986	0.622	1.558	-0.062	0.950	
Attitudes								
Weather averse	-0.126	0.054	0.882	0.793	0.981	-2.323	0.020	**
Commute efficiency	-0.097	0.061	0.908	0.806	1.023	-1.590	0.112	
Environment and health	0.171	0.052	1.186	1.072	1.313	3.314	< .001	***
Unsatisfied|somewhat satisfied	-1.403	0.267				-5.259	< .001	***
Somewhat satisfied|satisfied	1.939	0.268				7.235	< .001	***
Residual deviance:	3240.9							
AIC:	3268.9							
McFadden's Rho-sq:	0.052							
McFadden's Rho-sq (adj.):	0.047							

Note: * indicates significant at 0.1, ** indicates significant at 0.05, *** indicates significant at 0.001

5.0 Discussion and implications

Campus participation is an important indicator of student well-being, yet the role of the commute as an enabler or barrier to campus participation is understudied. Using survey data from 1,931 students at Ryerson University, this MRP investigated the role of commute satisfaction in campus participation and academic success as proxies for student well-being. Specifically, it analyzed whether commute satisfaction and academic success was positively associated with campus participation and the factors associated with higher commute satisfaction. A better understanding of characteristics of satisfied student commuters can assist in improving campus participation and academic success and, by extension, well-being.

5.1 – Commute satisfaction, campus participation, and academic success

The majority of students reported their commute negatively impacted all five campus participation outcomes (Table 4-2). These findings are significant in light of existing literature that highlights the importance on campus participation to student success (Coutts et al., 2018; Leveson et al., 2013; Martin, 2009). These findings are also consistent with Coutts et al. (2018) who found a negative influence of commuting on campus participation.

Binomial logistic regressions showed strong statistical association between levels of commute satisfaction and campus participation and academic success outcomes, supporting the hypothesis that commute satisfaction is positively associated with campus participation and academic success. This is a novel finding that highlights the importance of a satisfying commute for student well-being. A dissatisfaction with commute likely causes students to reduce or avoid their commute as much as possible, which would explain a reluctance to come to campus or stay on campus to participate in classes and other

university activities. It is also possible a dissatisfaction with commute encourages students to combine as many activities as possible into days they do commute, as theorized by Kobus et al. (2015) and supported by the finding that 57% of students reported picking their courses based on their commute (Table 4-2). On the other hand, students who are satisfied with their commute likely do not see their commute as a burden. These students may derive positive utility from their commute or at the very least not experience disutility, making it more appealing to travel to campus regularly. Investigating campus participation and academic success outcomes further, these findings support existing literature showing a positive association between campus participation, social capital, and academic achievement (Coutts et al., 2018; Leveson et al., 2013; Martin, 2009), a negative association between commute times and campus participation (Coutts et al., 2018; Kobus et al., 2015), and theorizations about the indirect influence of commute satisfaction on well-being through activity participation that informed the conceptual model described in Section 2.5 (Bergstad et al., 2011; De Vos et al., 2013; De Vos & Witlox, 2017; Ettema et al., 2010). The finding that almost 40% of students reported their commute is a barrier to their academic success is important in light of existing literature showing self-esteem decreases when students receive lower grades than expected (Crocker et al., 2003). Considering "academic success" was a self-reported measure comparing desired academic performance with actual academic performance, this finding suggests a significant number of students are not meeting their academic goals, negatively impacting their well-being.

Sociodemographic variables were included in the binomial logistic regression models primarily as control variables, however doing so yielded some interesting findings. Older students were less likely to agree their commute negatively impacted their campus participation. This may result from increasing skills, motivations, and persistence as one

progresses through education that override negative elements of a commute. Females were more likely to report negative impacts of their commute on participation in university activities and picking courses, though it is unclear why. Students that live at home/with a partner reported negative impacts of their commute for all participation outcomes and were 3.44 times more likely to say their commute discouraged them from coming to campus compared to students that lived alone or with roommates. This is opposite of the finding from Coutts et al. (2018) that students that live with their family/partner were less likely to be discouraged from coming to campus. The impact of living situation on campus participation constitutes an area for future research, however it is outside the scope of this MRP.

5.2 – Correlates of commute satisfaction

Having established a statistically significant association between commute satisfaction and campus participation and academic success, an analysis of commute satisfaction correlates was undertaken to explore the second research question of this MRP. Ordinal logistic regression results found commute mode and travel attitudes to be statistically significant correlates for commute satisfaction. Certain sociodemographic variables – age and student type – were also statistically significant.

Students who walked (OR = 3.82), cycled (OR = 2.10), or took local transit to campus were much more likely to report higher commute satisfaction. These findings are consistent with an extensive literature showing users of active travel modes are generally more satisfied than users of other modes, and that users of local transit are typically less satisfied (De Vos et al., 2016; Friman et al., 2017; Handy & Thigpen, 2019; E. Morris & Guerra, 2015; Ory & Mokhtarian, 2005; Páez & Whalen, 2010; St-Louis et al., 2014; Ye & Titheridge, 2017). Regression results do not reveal *why* these users are more or less satisfied, but it is likely a combination of commute characteristics and personal attitudes.

For example, commutes using active modes are generally short and predictable while taking transit is often long and subject to delays. Singleton's (2019) finding that active commuters rank high on feelings of autonomy, confidence, and health, and that transit users rank low on feelings of autonomy and confidence could also explain differing levels of satisfaction levels.

Students with weather-averse attitudes towards travel were less likely to report high commute satisfaction (OR = 0.88). Though this MRP did not link travel attitudes to specific mode use or mode preferences, avoiding rain, snow, heat, or cold precludes active modes of travel, or makes active modes potentially less pleasant to use in inclement weather. Findings from St-Louis et al. (2014) that snowy conditions reduced commute satisfaction for walkers, cyclists, and bus users, and from Ettema et al. (2017) that sunshine negatively influenced travel satisfaction for walkers and cyclists could potentially explain some of these results. With the exception of active transportation users, Ettema et al. (2017) also found sunshine positively influences travel satisfaction while travel satisfaction is negatively influenced by rain and snow. This finding may help to explain lower commute satisfaction among weather-averse students in the Toronto context as weather is often cold, rainy, and snowy for much of the school year. Additionally, St-Louis et al. (2014) found a "mismatch" between preferred travel mode and actual travel mode negatively influenced satisfaction, and hypothesized active commuters that switch to non-active modes in colder months may report lower satisfaction. This may explain lower commute satisfaction with weather-averse attitudes as students that prefer to commute using active modes but are also weather averse may switch to a less preferred mode when the weather changes.

Valuing environmentally friendly and active travel predicted greater commute satisfaction (OR = 1.19), which is consistent with findings in existing literature (Ory &

Mokhtarian, 2005; Ye & Titheridge, 2017). Here it is possible that students may see less pleasant travel experiences – crowded transit, cold weather – as an acceptable trade-off for travel that is environmentally friendly and/or active and be more satisfied as a result.

These attitudinal findings support a limited literature showing travel satisfaction is linked, at least in part, to one's travel values, beliefs, and preferences (De Vos et al., 2016; Ory & Mokhtarian, 2005; Singleton, 2019; St-Louis et al., 2014; Ye & Titheridge, 2017). The attitudinal findings in this MRP provide insight into which elements of travel students value independent of travel mode or general attitudes toward travel, which have been the primary focus of previous research.

Finally, like the binomial regression analysis described in Section 5.2, sociodemographic variables in the model were included primarily as control variables. Statistically significant association with higher commute satisfaction was observed for older and graduate students which is consistent with previous findings that age is positively associated with travel satisfaction (Bergstad et al., 2011; De Vos et al., 2016; Friman et al., 2017; St-Louis et al., 2014; Ye & Titheridge, 2017).

5.3 – Policy implications

The findings in this MRP that commute satisfaction is strongly and positively associated with campus participation and academic success means policies targeting improving commute satisfaction could significantly benefit student well-being outcomes.

The finding that walking and cycling result in the greatest commute satisfaction among travel modes suggests policy should be designed to encourage and enable students to use these modes. For universities and colleges, this means making the campus a welcoming place for pedestrians and cyclists. Many Canadian universities have worked with

municipal planners to pedestrianize portions of their campus (Johnson, 2014). These spaces not only allow pedestrians to navigate campus safely on foot but are also valued for creating a sense of "place" on campus, as well as being additional areas where students can socialize. On-campus cycling amenities such as ample and secure bike parking may also encourage more students to commute by bike. In Toronto, 16% of all bicycle thefts reported between 2014 and 2019 occurred in the areas immediately surrounding Ryerson University (Toronto Police Service, 2020), and the perception of theft may discourage potential cycling commuters.

However, campuses, especially those in large urban regions, are not islands, and on-campus measures to encourage active commuting alone are will likely be insufficient without integrating with the wider urban fabric, particularly if an institution has a large portion of students that live off campus. Therefore, colleges and universities should work with municipal planners to advocate for improved public realm and cycling facilities in the areas immediately surrounding their campuses. Wider sidewalks could make walking to campus more enjoyable, and safe cycling infrastructure on key travel routes to campus could encourage more people to cycle. Recent studies suggests enjoyable experiences with active travel modes for leisure trips increases the likelihood of using active mode in the future (De Vos et al., 2016, 2019). Though commutes to school are not necessarily leisure trips, this finding suggests that students may be willing to adopt active commuting modes if they have consistent positive experiences when doing so.

Walking and cycling are only feasible commute modes if students live within a certain proximity to campus. Accordingly, encouraging active commuting goes hand-in-hand with increasing the supply of affordable student housing near campus. In addition to traditional purpose-built student accommodation, many post-secondary institutions have

increased their on-campus housing in recent years by incorporating residential components into new academic buildings. This mixed-use model should be encouraged. The recently opened Daphne Cockwell Complex at Ryerson University is an example of this model, with academic uses such as classrooms, labs, and offices on the lower floors, and student residences on the upper floors. Mixed-use buildings like these serve the academic mission of the institution, but also help to activate the campus outside of traditional teaching hours, increasing campus vitality and opportunities for students to participate in campus activities. While the effect of commute time on commute satisfaction was not analyzed in the context of this MRP, previous research into commute times and campus participation (Coutts et al., 2018) found longer commutes were negatively associated with campus participation. Based on this, it is realistic to assume students will be less discouraged from coming to campus if their commute is shorter, an outcome that is achieved by living on or near campus. Municipal and provincial planners can also contribute by using or developing policy tools to support affordable student housing near campuses, for example, by reviewing and amending zoning by-laws or land use where appropriate.

Colleges and universities should also consider providing short-term accommodation on campus for students that are unable or choose not to live on or near campus. Existing literature shows that a negative commute experience can negatively impact task performance at the destination (Ettema et al., 2010; Schaeffer et al., 1988; Wener et al., 2005). Short-term accommodations support commuter students by reducing their commute on days when they have important academic commitments such as exams. An innovative example of this is the Ryerson University Commuter Hostel, which allows students to stay in on-campus accommodation for a maximum of three consecutive nights and nine nights total in a one-month period. Within less than a year of opening, the hostel had an average

waitlist of 5-6 students per week and approximately 25 students per week during exam periods demonstrating significant student demand (Bruce, 2016). Post-secondary institutions could also explore partnering with private groups to provide additional student accommodation. For example, many colleges and universities have agreements with nearby hotels to offer discounted rates to guests of the institution. It may be worth leveraging these existing relationships to explore opportunities related to short- or long-term accommodation for students.

Outside of accommodations, colleges and universities should also invest in inviting facilities to encourage students to be physically present on campus. Long commutes may be less of a disincentive to come to campus if students have access to high-quality study, recreation, and social spaces.

Improved public transit also stands to benefit students, post-secondary institutions, and the regions in which they live. Findings in this MRP showed commute satisfaction was lowest for those who commuted by local transit. Considering the majority of Ryerson students rely on this mode for their commute (55%), changes that result in even a modest increase in commute satisfaction would contribute to improved well-being outcomes for a large number of students, with a positive impact on the institution. However, there are benefits to improved transit beyond student and institutional success. Many municipalities and regions are trying to encourage the use of more sustainable modes of travel, including local transit, as part of broader urban sustainability goals. Service improvements that result in greater commute satisfaction may increase the number of students and non-students that use local transit, supporting these sustainability goals. Increased ridership would result in more revenue for transit operators that can be put towards more service improvements.

5.4 Study limitations

This analysis was limited by the StudentMoveTO data available at the time of writing. The data collection period ran from October 1, 2019 until November 30, 2019 and results may have been different if the survey period had been longer or during a different time of the year. Additionally, commute distance/travel time data was not available for research in February 2020 when this analysis was conducted. As a result, commute distance could not be included in the statistical models, which may have implications for the results of mode on commute satisfaction. Specifically, it is possible that the association between travel mode and commute satisfaction is confounded by travel distance and/or time. In other words, students may be more satisfied with walking and cycling because they are commuting for shorter distances, not necessarily because they are using these modes specifically. Controlling for commuting distance should be an important part of any future research in this area.

Another variable that may have been useful but was excluded from the models is household location. Locational data was not available at the time of analysis but could have provided some additional insight into commute satisfaction associated with geographies of residence. For example, students that live in more suburban locations may have different travel preferences and attitudes than students living in urban areas. Additionally, transit is typically more limited in suburban areas. Both factors may affect commute satisfaction.

Commute satisfaction in this study was estimated by means of an unweighted sum of reported scores of three questions related to satisfaction with commute in the previous day based on the assumption that this commute was typical of the student's overall commute experience. It is difficult to determine if the previous day's commute was representative of the typical commute experience, and the commute may have been better

or worse than average. Results may have been different had students been asked to rate their overall commute satisfaction based on their commute on a different day.

Survey design may have also affected the results. A lengthy questionnaire may have discouraged some students from completing it. The number of participants that did not answer all questions speaks to this as a real possibility. This also caused the sample size to drop by 50% following data cleaning for complete responses, introducing potential sampling bias into the analysis. The survey was also promoted as an opportunity to help students improve their commute. This framing may have resulted in a response bias where those who dislike their commute were more motivated to participate whereas students who were already satisfied with their commute were not.

Over- and underrepresentation of certain groups in the survey may have also impacted the results. Specifically, there was a larger graduate and female response rate when compared to the Ryerson population as a whole. This is potentially an issue based on previous findings that travel satisfaction increases with age and graduate students report greater commute satisfaction. Findings that female students are more likely to use active modes than males in the Toronto area (Moniruzzaman & Farber, 2018) may also overstate the influence of active modes on commute satisfaction. However, the level of overrepresentation of these groups is such that any impact on the results is likely to be minor.

6.0 Conclusion

This MRP analyzed commute survey data from 1,931 students at Ryerson University to explore whether students perceived their commute to be a barrier to their campus participation and academic success, used here as proxies for student well-being, and whether these perceptions changed depending on commute satisfaction. A conceptual model was developed based on existing literature that hypothesized that campus participation and academic success outcomes are directly influenced by commute satisfaction, which is in turn correlated with sociodemographics, commute mode, and travel attitudes. Using this model, sociodemographic, commute mode, and travel attitude correlates of commute satisfaction were analyzed to understand factors that contribute to or detract from commute satisfaction.

The analysis revealed that students overwhelmingly consider their commute to be a barrier to campus participation and academic success. This finding is consistent with a limited literature highlighting the negative impact of commuting on student well-being pertaining to campus participation, student perseverance, and academic achievement (Coutts et al., 2018; Kobus et al., 2015; Leveson et al., 2013). The findings also show that student commute satisfaction is strongly and positively associated with campus participation and self-reported academic success. To the knowledge of the author, this is a novel contribution to the existing literature and deepens the understanding of the impact of transportation on student well-being.

Commute mode and travel attitudes were found to be statistically significant correlates of commute satisfaction. Students that walked or cycled to campus were more likely to be satisfied with their commute, followed by regional transit users, and with local transit users least likely to be satisfied. These findings are consistent with a growing body of

research showing higher travel satisfaction associated with active transportation modes and lower travel satisfaction associated with public transit (De Vos et al., 2016; Friman et al., 2017; Handy & Thigpen, 2019; E. Morris & Guerra, 2015; Ory & Mokhtarian, 2005; Páez & Whalen, 2010; St-Louis et al., 2014; Ye & Titheridge, 2017). Regarding travel attitudes, students that were weather averse were less likely to report higher commute satisfaction while students that valued environmentally friendly and active commutes were more likely to be satisfied. This is consistent with earlier findings that environmentally-friendly attitudes are associated with greater travel satisfaction (Ory & Mokhtarian, 2005; Ye & Titheridge, 2017), as well as that travel satisfaction can be influenced by travel attitudes more generally. Other attitudinal findings in existing literature could not be confirmed due to different attitudinal questions asked in the travel survey data analyzed in this MRP.

These findings suggest several areas of policy focus for colleges and universities, as well as urban and transportation planners. First, given the high degree of commute satisfaction associated with walking and cycling, policies should be implemented to increase the use of active transportation both on and to campus. College and university administration can work to make their campus more friendly to these modes, and work with urban and transportation planners to ensure quality walking and cycling infrastructure in the areas surrounding their campus. Second, colleges and universities should also invest or continue to invest in student accommodation on or near campus. Nearby accommodation makes it more feasible for students to commute using active modes to get to campus and also increases the likelihood of students participating in campus activities due to campus proximity, contributing to an animated and vibrant campus. Administrators can also work with planners to develop regulatory policy favourable to affordable student housing near campus. Third, high-quality study, recreation, and social spaces on campus can encourage

53

students to come to and stay on campus. Finally, improvements to local transit would likely result in increased commute satisfaction for students and non-students alike, encouraging use of a sustainable transit mode among the wider population with positive impacts for urban and regional sustainability.

While this research took place in the context of the Greater Toronto and Hamilton Area, policy implications and suggestions can be applied to colleges and universities in small, medium, or large urban areas, depending on institutional needs and priorities. However, given the interconnected nature of these policy areas – encouraging active transportation, investing in student accommodation, improving local transit, and providing quality on-campus facilities – they are likely to be most effective if approached and implemented simultaneously.

References

Andrietti, V., & Velasco, C. (2015). Lecture Attendance, Study Time, and Academic

Performance: A Panel Data Study. *The Journal of Economic Education*, *46*(3), 239–

259. https://doi.org/10.1080/00220485.2015.1040182

Bergstad, C., Gamble, A., Gärling, T., Hagman, O., Polk, M., Ettema, D., Friman, M., &

Olsson, L. (2011). Subjective well-being related to satisfaction with daily travel.

Transportation, *38*(1), 1–15. https://doi.org/10.1007/s11116-010-9283-z

Bruce, V. (2016, May 4). *Going Hostel: Housing & Residence Life's New Commuter

Program*. Ryerson University.

https://www.ryerson.ca/studentaffairs/storytelling/2016/05/going-hostel--housing---

residence-life-s-new-commuter-program/

Clark, M. R. (2006). Succeeding in the city: Challenges and best practices on urban

commuter campuses. *About Campus*, *11*(3), 2–8. https://doi.org/10.1002/abc.166

Coutts, S., Aird, B., Mitra, R., & Siemiatycki, M. (2018). Does commute influence post-

secondary Students' social capital? A study of campus participation at four

universities in Toronto, Canada. *Journal of Transport Geography*, *70*(Complete),

172–181. https://doi.org/10.1016/j.jtrangeo.2018.06.006

Crocker, J., Karpinski, A., Quinn, D. M., & Chase, S. K. (2003). When Grades Determine

Self-Worth: Consequences of Contingent Self-Worth for Male and Female

Engineering and Psychology Majors. *Journal of Personality and Social Psychology*,

85(3), 507–516. https://doi.org/10.1016/S0022-3514(03)02904-2

Danaf, M., Abou-Zeid, M., & Kaysi, I. (2014). Modeling travel choices of students at a

private, urban university: Insights and policy implications. *Case Studies on Transport

Policy*, *2*(3), 142–152. https://doi.org/10.1016/j.cstp.2014.08.006

De Vos, J., Mokhtarian, P., Schwanen, T., Van Acker, V., & Witlox, F. (2016). Travel mode choice and travel satisfaction: Bridging the gap between decision utility and experienced utility. *Transportation*, *43*(5), 771–796. https://doi.org/10.1007/s11116-015-9619-9

De Vos, J., Schwanen, T., Van Acker, V., & Witlox, F. (2013). Travel and Subjective Well-Being: A Focus on Findings, Methods and Future Research Needs. *Transport Reviews*, *33*(4), 421–442. https://doi.org/10.1080/01441647.2013.815665

De Vos, J., Schwanen, T., Van Acker, V., & Witlox, F. (2019). Do satisfying walking and cycling trips result in more future trips with active travel modes? An exploratory study. *International Journal of Sustainable Transportation*, *13*(3), 180–196. https://doi.org/10.1080/15568318.2018.1456580

De Vos, J., & Witlox, F. (2017). Travel satisfaction revisited. On the pivotal role of travel satisfaction in conceptualising a travel behaviour process. *Transportation Research Part A: Policy and Practice*, *106*, 364–373. https://doi.org/10.1016/j.tra.2017.10.009

Diener, E. (2000). Subjective Well-Being: The Science of Happiness and a Proposal for a National Index. *American Psychologist*, *55*(1), 34–43. https://doi.org/10.1037//0003-066X.55.1.34

Ettema, D., Friman, M., Olsson, L. E., & Gärling, T. (2017). Season and Weather Effects on Travel-Related Mood and Travel Satisfaction. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.00140

Ettema, D., Gärling, T., Eriksson, L., Friman, M., Olsson, L. E., & Fujii, S. (2011). Satisfaction with travel and subjective well-being: Development and test of a measurement tool. *Transportation Research Part F: Psychology and Behaviour*, *14*(3), 167–175. https://doi.org/10.1016/j.trf.2010.11.002

Ettema, D., Gärling, T., Olsson, L. E., & Friman, M. (2010). Out-of-home activities, daily travel, and subjective well-being. *Transportation Research Part A*, *44*(9), 723–732. https://doi.org/10.1016/j.tra.2010.07.005

Evans, G., Wener, R., & Phillips, D. (2002). The Morning Rush Hour: Predictability and Commuter Stress. *Environment and Behavior*, *34*(4), 521–530. https://doi.org/10.1177/00116502034004007

Falch, T., Lujala, P., & Strøm, B. (2013). Geographical constraints and educational attainment. *Regional Science and Urban Economics*, *43*(1), 164–176. https://doi.org/10.1016/j.regsciurbeco.2012.06.007

Friman, M., Gärling, T., Ettema, D., & Olsson, L. E. (2017). How does travel affect emotional well-being and life satisfaction? *Transportation Research Part A: Policy and Practice*, *106*, 170–180. https://doi.org/10.1016/j.tra.2017.09.024

Gottholmseder, G., Nowotny, K., Pruckner, G. J., & Theurl, E. (2009). Stress perception and commuting. *Health Economics*, *18*(5), 559–576. https://doi.org/10.1002/hec.1389

Grayson, J. P. (1997). Place of Residence, Student Involvement, and First Year Marks. *Canadian Journal of Higher Education*, *27*(1), 1–23.

Handy, S., & Thigpen, C. (2019). Commute quality and its implications for commute satisfaction: Exploring the role of mode, location, and other factors. *Travel Behaviour and Society*, *16*, 241–248. https://doi.org/10.1016/j.tbs.2018.03.001

Hasnine, M. S., Lin, T., Weiss, A., & Habib, K. N. (2018). Determinants of travel mode choices of post-secondary students in a large metropolitan area: The case of the city of Toronto. *Journal of Transport Geography*, *70*(Complete), 161–171. https://doi.org/10.1016/j.jtrangeo.2018.06.003

Hooff, M. L. M. (2015). The Daily Commute from Work to Home: Examining Employees'

    Experiences in Relation to Their Recovery Status. *Stress and Health*, *31*(2), 124–

    137. https://doi.org/10.1002/smi.2534

Johnson, T. (2014). Transforming the campus with car-free pedestrian zones. *University*

    Affairs. https://www.universityaffairs.ca/features/feature-article/unpaving-paradise/

Khattak, A., Wang, X., Son, S., & Agnello, P. (2011). Travel by University Students in

    Virginia: Is This Travel Different from Travel by the General Population?

    Transportation Research Record: Journal of the Transportation Research Board,

    2255(1), 137–145. https://doi.org/10.3141/2255-15

Kobus, M. B. W., Van Ommeren, J. N., & Rietveld, P. (2015). Student commute time,

    university presence and academic achievement. *Regional Science and Urban*

    Economics, *52*, 129–140. https://doi.org/10.1016/j.regsciurbeco.2015.03.001

Krause, K.-L. (2007, January 1). *Social Involvement and Commuter Students: The First-*

    Year Student Voice [Text]. National Resource Center for The First-Year Experience

    & Students in Transition. https://www-ingentaconnect-

    com.ezproxy.lib.ryerson.ca/search/article?option1=tka&value1=social+involvement&

    operator2=AND&option2=author&value2=krause&freetype=unlimited&sortDescendin

    g=true&sortField=default&pageSize=10&index=1

Leveson, L., McNeil, N., & Joiner, T. (2013). Persist or withdraw: The importance of external

    factors in students' departure intentions. *Higher Education Research &*

    Development, *32*(6), 932–945. https://doi.org/10.1080/07294360.2013.806442

Limanond, T., Butsingkorn, T., & Chermkhunthod, C. (2011). Travel behavior of university

    students who live on campus: A case study of a rural university in Asia. *Transport*

    Policy, *18*(1), 163–171. https://doi.org/10.1016/j.tranpol.2010.07.006

López Turley, R., & Wodtke, G. (2010). College Residence and Academic Performance: Who Benefits From Living on Campus? *Urban Education*, *45*(4), 506–532. https://doi.org/10.1177/0042085910372351

Martin, N. D. (2009). Social Capital, Academic Achievement, and Postgraduation Plans at an Elite, Private University. *Sociological Perspectives*, *52*(2), 185–210. JSTOR. https://doi.org/10.1525/sop.2009.52.2.185

Moniruzzaman, M., & Farber, S. (2018). What drives sustainable student travel? Mode choice determinants in the Greater Toronto Area. *International Journal of Sustainable Transportation*, *12*(5), 367–379. https://doi.org/10.1080/15568318.2017.1377326

Morris, E. A. (2015). Should we all just stay home? Travel, out-of-home activities, and life satisfaction. *Transportation Research Part A*, *78*(Complete), 519–536. https://doi.org/10.1016/j.tra.2015.06.009

Morris, E., & Guerra, E. (2015). Mood and mode: Does how we travel affect how we feel? *Transportation*, *42*(1), 25–43. https://doi.org/10.1007/s11116-014-9521-x

Nash, S., & Mitra, R. (2019). University students' transportation patterns, and the role of neighbourhood types and attitudes. *Journal of Transport Geography*, *76*(Complete), 200–211. https://doi.org/10.1016/j.jtrangeo.2019.03.013

Ory, D. T., & Mokhtarian, P. L. (2005). When is getting there half the fun? Modeling the liking for travel. *Transportation Research Part A*, *39*(2–3), 97–123. https://doi.org/10.1016/j.tra.2004.09.006

Páez, A., & Whalen, K. (2010). Enjoyment of commute: A comparison of different transportation modes. *Transportation Research Part A*, *44*(7), 537–549. https://doi.org/10.1016/j.tra.2010.04.003

Parker, P. D., Jerrim, J., Anders, J., & Astell-Burt, T. (2016). Does Living Closer to a

    University Increase Educational Attainment? A Longitudinal Study of Aspirations,

    University Entry, and Elite University Enrolment of Australian Youth. *Journal of Youth*

    and Adolescence, *45*(6), 1156–1175. https://doi.org/10.1007/s10964-015-0386-x

Ryerson University. (n.d.a). *Residence Buildings | Housing & Residence Life—*

    Housingandresidence—Ryerson University. https://www.ryerson.ca/housing/future-

    students/residence-buildings/

Ryerson University. (n.d.b). *Statistics—University Planning Office—Ryerson University*.

    https://www.ryerson.ca/upo/statistics/#

Schaeffer, M. H., Street, S. W., Singer, J. E., & Baum, A. (1988). Effects of Control on the

    Stress Reactions of Commuters1. *Journal of Applied Social Psychology*, *18*(11),

    944–957. https://doi.org/10.1111/j.1559-1816.1988.tb01185.x

Schneider, R. J., & Willman, J. L. (2019). Move closer and get active: How to make urban

    university commutes more satisfying. *Transportation Research Part F: Traffic*

    Psychology and Behaviour, *60*(Complete), 462–473.

    https://doi.org/10.1016/j.trf.2018.11.001

Shannon, T., Giles-Corti, B., Pikora, T., Bulsara, M., Shilton, T., & Bull, F. (2006). Active

    commuting in a university setting: Assessing commuting habits and potential for

    modal change. *Transport Policy*, *13*(3), 240–253.

    https://doi.org/10.1016/j.tranpol.2005.11.002

Singleton, P. A. (2019). Walking (and cycling) to well-being: Modal and other determinants

    of subjective well-being during the commute. *Travel Behaviour and Society*, *16*, 249–

    261. https://doi.org/10.1016/j.tbs.2018.02.005

Statistics Canada, S. C. (2017, February 8). *Population and Dwelling Count Highlight Tables, 2016 Census*. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/pd-pl/Table.cfm?Lang=Eng&T=701&SR=1&S=3&O=D&RPP=25

St-Louis, E., Manaugh, K., van Lierop, D., & El-Geneidy, A. (2014). The happy commuter: A comparison of commuter satisfaction across modes. *Transportation Research Part F: Psychology and Behaviour*, *26*(Part A), 160–170. https://doi.org/10.1016/j.trf.2014.07.004

StudentMoveTO. (2016). *An overview of early findings*. http://www.studentmoveto.ca/wp-content/uploads/2018/06/StudentMoveTO.Handout_4Uni.v1.pdf

Tigre, R., Sampaio, B., & Menezes, T. (2017). The Impact of Commuting Time on Youth's School Performance. *Journal of Regional Science*, *57*(1), 28–47. https://doi.org/10.1111/jors.12289

Toronto Police Service. (2020). *Bicycle Thefts*. https://data.torontopolice.on.ca/datasets/bicycle-thefts

Universities Canada. (n.d.). Enrolment by university. *Universities Canada*. https://www.univcan.ca/universities/facts-and-stats/enrolment-by-university/

Wener, R., Evans, G. W., & Boately, P. (2005). Commuting Stress: Psychophysiological Effects of a Trip and Spillover into the Workplace. *Transportation Research Record: Journal of the Transportation Research Board*, *1924*(1), 112–117. https://doi.org/10.1007/978-1-4757-9765-7

Whalen, K. E., Páez, A., & Carrasco, J. A. (2013). Mode choice of university students commuting to schooland the role of active travel. *Journal of Transport Geography*, *31*(Complete), 132–142. https://doi.org/10.1016/j.jtrangeo.2013.06.008

Williams, R. (2016). Understanding and interpreting generalized ordered logit models. *The Journal of Mathematical Sociology*, *40*(1), 7–20. https://doi.org/10.1080/0022250X.2015.1112384

Ye, R., & Titheridge, H. (2017). Satisfaction with the commute: The role of travel mode choice, built environment and attitudes. *Transportation Research Part D: Transport and Environment*, *52*(Part B), 535–547. https://doi.org/10.1016/j.trd.2016.06.011

Zhou, J. (2012). Sustainable commute in a car-dominant city: Factors affecting alternative mode choices among university students. *Transportation Research Part A*, *46*(7), 1013–1029. https://doi.org/10.1016/j.tra.2012.04.001